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ABSTRACT

A technique that institutional researchers can use to assist department chairpersons in balancing student needs and faculty resources is described. Basic institutional research office data is combined with departmental data so that the department heads can justify their needs, plan recruiting, select students to achieve a balance of faculty resources, and accommodate the instructional needs of student majors and student nonmajors. The approach is illustrated using the example of a psychology department. A second illustration examines two departments that used critical mass data to evaluate the effects of a merger. The results indicate that cost data generated for funding purposes and student curriculum patterns can be converted into data that are directly useful to academic department chairpersons. The proposed solutions affect the balances between ideal and actual ratios, the major to nonmajor mix, and the FTE faculty and student counts. It is suggested that direct applications of critical mass evaluation provide the institutional research office with the opportunity to increase their service to academic departments. It is also suggested that critical mass evaluation enables department chairpersons to make realistic academic decisions based on budgetary constraints. (Author/SF)

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Toward a Definition of the Critical Mass of an Academic Department

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Running Head: Critical Mass

Abstract

This paper describes a technique which institutional researchers can use to assist department chairpersons in balancing student needs and faculty resources. This technique provides a method for taking basic institutional data and combining it with departmental data to provide solutions to problems which cause imbalances. The proposed solutions affect the present balances between the ideal and actual ratios, the major to non-major mix, and the FTE faculty and student counts. These direct applications to specific departmental problems should provide the institutional research office with the opportunity to increase the service to academic departments.

Toward a Definition of the Critical Mass of an Academic Department

Introduction

One of our continually weak areas seems to be the relationship between the Office of Institutional Research and any given academic department head. The institutional researcher is cautious in dealing with department heads for fear that information provided will be misused to gain favor, particularly in matters of resource justification. The department head is cautious for fear that any shared confidence about the true nature of the department will result in unfavorable resource allocations. Even when the question of resources is removed, there is a mutual distrust of the data each collects and the purpose each has in mind for any analysis which is made. There is also the problem of the level at which data are combined and the categories into which the data are aggregated. One can find Higher Education General Information System (HEGIS) coded data easily, college data usually, departmental data occasionally, and degree track data almost never. This has resulted over the past decade, from an increased pressure to report to state and federal agencies who control funds. Collective bargaining has further strained the relationship and clouded the already murkey relationship among middle managers. Perhaps the greatest gap exists in the fundamentally different point of view institutional researchers hold about the complexity of the data department heads really need. Institutional researchers can provide complex analysis of cost per student credit hour by level related to any other cost indicators. The department head often needs simply to know how many majors are assigned to the department.

The Purpose

The purpose of this paper is to describe an approach which institutional researchers can use to assist department heads to relate the number of majors to their "balance of trade" with other departments and then to estimate the number of faculty members who, along with their special competencies, form a justifiable critical mass.

The Problem

The approach departs from large computer systems model and is directed toward the problem which individual department heads face when they are asked to justify their needs, to plan recruiting, and to select students in such a manner that they will achieve a balance of faculty resources to accomodate the instructional needs of student majors and student non-majors. To achieve these curricular balances, the department head has to know the number of faculty members needed to teach each course required by majors and the number of faculty members required to teach courses elected by both majors and non-majors. The special area of each faculty member's competence needs to be balanced with the number of students who need instruction in those special areas.

The Method

The approach described in this paper provides a method for taking basic institutional research office data and combining it with departmental data so that the department head can define his critical mass and balance student needs with faculty resources.

The approach assumes that each academic department has a core of courses and several specialties, sub-specialties, or sub-divisions which in the Florida State System are called degree tracks. An example of tracks within the psychology

department, in addition to general psychology, would be clinical psychology, educational psychology, or experimental psychology. The majors, courses, and faculty for each degree track need to be identified by the academic department head and recorded for the files of the department. Catalog copy has to be written to describe the requirements of each track. The funding formulas are then used to estimate the number of faculty members required in order to maintain a teaching program for the number of majors identified. The institutional research office data are useful here in establishing the actual number of majors and non-majors in each of the courses and the instructional productivity computations used by the institution.

To illustrate we have applied the approach to a department of psychology to identify its critical mass. A second illustration relates two departments who used critical mass data to evaluate a merger upon the programs of each department.

Assumptions: Graduate Programs Florida State University System

1. Faculty Productivity:

234 Student Credit Hours Per Quarter (SCH/Q)	Lower and upper division courses
178 SCH/Q	Graduate courses
59 SCH/Q	Dissertation or thesis

2. Student Curriculum Patterns:

Ratio of courses to dissertation or thesis is 4 to 1.

3. Track Requirements:

Two faculty are required to support one track.

4. One Full Time Equivalent (FTE) Student = 12 credit hours per quarter

The Analysis:

Let C = Number of student graduate course credit hours per quarter

D = Number of student dissertation credit hours per quarter

L = Number of student lower division course credit hours per quarter

U = Number of student upper division course credit hours per quarter

Two equations are now written which specify faculty productivity requirements and ideal curriculum mix.

Equation 1 specifies that faculty load consisting of graduate courses and dissertation must total 178 adjusted SCH/Q.

$$C + 3.04\ D = 178 \qquad (1)$$

Note that: dissertation hours are equated to graduate course hours by multiplying by 3.04.

Equation 2 specifies that an ideal curriculum mix consists of four times as many course student credit hours as dissertation credit hours.

$$C - 4\ D = 0 \qquad (2)$$

Solving these equations simultaneously, we are able to find an "ideal" faculty load.

$$C + 3.04\,D = 178$$

$$C - 4\,D = 0$$

Ideal Faculty Load =

$$C = 101 \text{ SCH/Q}$$

$$D = 25 \text{ SCH/Q}$$

Ideal mix per track = 202 SCH/Q in graduate courses + 50 Student Credit Hours (SCH) dissertation.

Converting to FTE: 202/12 = 17

50/12 = 4

Ideal FTE mix per graduate track.

For undergraduate psychology programs, the equations would be $L + U = 234$ and $6.5\,L - U = 0$. In a similar fashion, ideal mix per track would be 6 FTE lower division majors and 38 FTE upper division majors.

In General:

IDEAL GRADUATE FACULTY LOAD

Graduate course credit hours = $\dfrac{r_1 P}{e + r_1}$

Dissertation credit hours = $\dfrac{P}{e + r_1}$

IDEAL UNDERGRADUATE LOAD

Lower division course credit hours = $\dfrac{Q}{1 + r_2}$

Upper division course credit hours = $\dfrac{r_2 Q}{1 + r_2}$

Where: P = Graduate Course Productivity (P)

D = Dissertation Productivity (D)

e = P/D

r_1 = ratio course to dissertation curriculum requirements

Q = lower and upper division course productivity

r_2 = ratio upper to lower division curriculum requirments

A "typical" department of psychology is presented in Table 1.

Table 1

Psychology Department

TRACK	MAJORS				RATIO		NON-MAJORS	BALANCE (SURPLUS OR DEFICIT)	
	STUDENT CURRICULUM LEVEL	IDEAL NUMBER	ACTUAL NUMBER	BALANCE	CURRICULUM	ACTUAL	FTE STUDENTS	FTE STUDENTS	FTE STUDENTS
General	L	6	3	- 3	1	1	50	+47	+5.5
Psychology	U	38	38	0	6.5	13	60	+60	
Experimental	GC	17	9.5	- 7.5	4	1.5	5	- 2.5	+ .2
Psychology	D	4	6	+ 2	1	1	0	+ 2	
Clinical	GC	17	18	+ 1	4	1.3	5	+ 6	+2.5
Psychology	D	4	14	+10	1	1	0	+10	
School	GC	17	11	- 6	4	1.5	3	- 3	+ .4
Psychology	D	4	7	+ 3	1	1	0	+ 3	
Social	GC	17	2	-15	4	.13	0	-15	-1.5
Psychology	D	4	1.5	- 2.5	1	1	0	- 2.5	

By examining this table for the clinical psychology degree, as an example, the value of this technique is illustrated. Although this track adequately supports its faculty, the ratio of students in graduate courses to students in dissertation departs from the ideal. The department chairperson is, therefore, alerted to a potential future problem and can then take steps to bring this ratio into balance.

A second illustration of the use of critical mass data is presented in Table 2. This analysis was used to investigate the feasibility of the merger of four departments, each containing one or more degree tracks.

Table 2

Merger of Four Academic Departments

TRACK	STUDENTS									FACULTY		
	MAJORS			SERVICE			BALANCE			BALANCE		
	M	I	E	S	N	E	TRACK	PROGRAM	DEPARTMENT	TRACK	PROGRAM	DEPARTMENT
Statistics	17 4	30	10	-20	20	84	+64	30	33	4.0	2.0	2.0
Institutional Research	17 4	30	4	-26	26	2	-24	0	0	-1.5	0	0
Evaluation and Measurement	17 4	30	11	-19	19	9	-10	0	0	- .5	0	0
Educational Psychology	17 4	30	8	-22	22	20	- 2	- 2	0	0	0	0
Educational Policy Analysis	17 4	30	6	-24	24	2	-22	-24	0	-1.5	-1.5	0
Management Systems	17 4	30	2	-28	28	2	-26	-24	0	-1.5	-1.5	0
Instructional Systems	17 4	30	43	+18	0	19	+37	53	18	2.5	3.5	1.5
Media Education	17 4	30	2	-28	28	97	+69	53	35	4.5	3.5	2.5

Ideal Mix (M) of FTE majors in graduate courses and dissertation to support degree track.

Ideal (I) Number of Equated FTE Majors Compared with the Number of Equated Majors Enrolled (E) Spring Quarter, 1977, the Balance (B) Compared with the Non-Majors (N) Needed and Served (E), and the Resulting Balance (B) for Students and Faculty Distributed Among Degree Tracks, Present Programs, and the Proposed Department.

Table 2 Summary:

a) An ideal program mix would provide 17 FTE course-taking students per quarter and 4 FTE dissertation students to support one program track. Since faculty are given 3.04 times as much credit for dissertation students, $17 + 3.04\ (4) \simeq 30$ equated FTE students are necessary to support a track.

b) Only one track, (Instructional Systems) is able to support itself with majors alone. Only Statistics, Instructional Systems, and Media Education are able to support themselves as tracks when service work is also included.

c) When tracks are grouped as programs, we are able to bring all into balance with the exception of Education Policy and Management Systems tracks.

d) When tracks are grouped in the "merged department," all deficiencies can be brought into balance; and strong programs, although giving up some excess, are able to maintain strong positions.

e) The proposed merged department is able to support 22 FTE faculty based on Spring 1977 data.

f) Three hundred twenty-six equated FTE students are supported by the proposed department merger based on Spring 1977 data.

Conclusion and Discussion

This paper demonstrates that the cost data generated for funding purpose and student curriculum patterns can be converted into data which are directly useful to academic department chairpersons. Chairpersons concerned with the problem of balancing individual faculty teaching and advising load within the department also need to be aware of institutional student credit hour productivity standards for generating funds. To maintain this balance each chairperson needs to know how many majors each faculty member should be advising; how many courses majors should be taking in the department; and how many students from other departments take courses within the department. With this information, the department chairperson can say, for example, "Professor Smith has ten doctoral students who take most of their course work within this department. He needs 15 to meet the funding requirements, and he makes up for these 5 students by teaching one course which has 25 non-majors enrolled each quarter."

It is not reasonable or desireable to expected faculty members to think this way, but department chairpersons need to think this way as they consider the impact changes in the curriculum will have in the funding formula of the institution. A department chairperson who is able to make this kind of critical mass of evaluation will be in a better position to make realistic academic decisions which are based to some extent on budgetary constraints.

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